

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

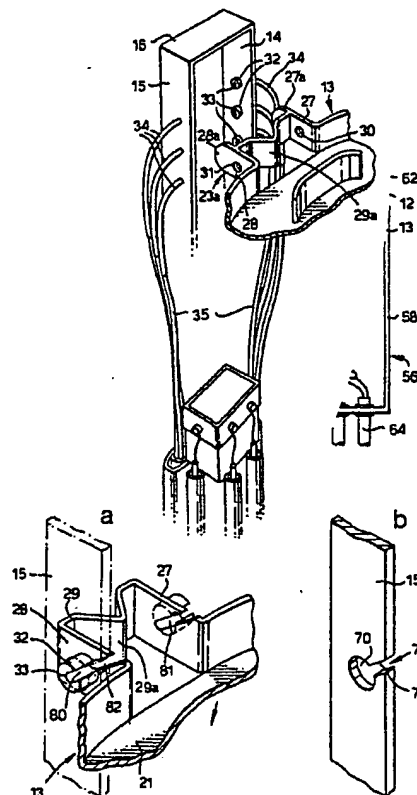
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|   |  |   |   |
|---|--|---|---|
| (51) International Patent Classification <sup>7</sup> :<br><b>G02B 6/44</b>   |  | A1  | (11) International Publication Number: <b>WO 00/65397</b>       |
|   |  |   | (43) International Publication Date: 2 November 2000 (02.11.00) |
| (21) International Application Number: PCT/GB00/01577   |  | (81) Designated States: AU, BR, CA, CN, CZ, HU, ID, IL, IN, JP, KR, MG, MX, NO, PL, RO, RU, TR, UA, US, ZA, European patent (AT, BE; CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). |   |
| (22) International Filing Date: 20 April 2000 (20.04.00)  |  |   |   |
| (30) Priority Data:<br>9909114.2 21 April 1999 (21.04.99) GB  |  | Published<br>With international search report.  |   |
| (71) Applicant (for all designated States except MG US): N.V. RAYCHEM S.A. [BE/BE]; Diestsesteenweg 692, B-3010 Kessel-Lo (BE).   |  |   |   |
| (71) Applicant (for MG only): TYCO ELECTRONICS UK LIMITED [GB/GB]; Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB).   |  |   |   |
| (72) Inventors; and<br>(75) Inventors/Applicants (for US only): WAMBEKE, Alain [BE/BE]; Solveld 32, B-3440 Zoutleeuw (BE). FRANCKX, Joris [BE/BE]; Halmenhoek 7, B-2820 Bonheiden (BE). |  |   |   |
| (74) Agents: BEITSMA, Gerhard, Romano et al.; Tyco Electronics UK Ltd., European Patent Department, Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB).                              |  |   |   |

(54) Title: OPTICAL FIBRE ORGANISER

## (57) Abstract

An optical fibre organiser system (11) is provided and comprises: a support (12), at least one fibre organiser module (13) selectively connectable to the support (12), a housing (18) for accommodating the or each module (13) mounted on the support (12), and cable entry means (41) at or adjacent one end of the support (12) through which one or more fibre optic cables (35) can enter the housing (18) generally parallel to the length of the support (12), and is characterised in that the support (12) comprises two substantially parallel elongate members (14, 15), the or each module (13) being pivotally connectable to the said members (14, 15), and in that the pivotal connection between a module (13) and at least one of the members (14, 15) defines a passage for the introduction of an optical fibre (35) into the said module (13).



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

|    |                          |    |  |    |  |    |                          |
|----|--------------------------|----|--|----|--|----|--------------------------|
| AL | Albania                  | ES | Spain                                    | LS | Lesotho                                      | SI | Slovenia                 |
| AM | Armenia                  | FI | Finland                                  | LT | Lithuania                                    | SK | Slovakia                 |
| AT | Austria                  | FR | France                                   | LU | Luxembourg                                   | SN | Senegal                  |
| AU | Australia                | GA | Gabon                                    | LV | Latvia                                       | SZ | Swaziland                |
| AZ | Azerbaijan               | GB | United Kingdom                           | MC | Monaco                                       | TD | Chad                     |
| BA | Bosnia and Herzegovina   | GE | Georgia                                  | MD | Republic of Moldova                          | TG | Togo                     |
| BB | Barbados                 | GH | Ghana                                    | MG | Madagascar                                   | TJ | Tajikistan               |
| BE | Belgium                  | GN | Guinea                                   | MK | The former Yugoslav<br>Republic of Macedonia | TM | Turkmenistan             |
| BF | Burkina Faso             | GR | Greece                                   |    |  | TR | Turkey                   |
| BG | Bulgaria                 | HU | Hungary                                  | ML | Mali   | TT | Trinidad and Tobago      |
| BJ | Benin                    | IE | Ireland                                  | MN | Mongolia                                     | UA | Ukraine                  |
| BR | Brazil                   | IL | Israel                                   | MR | Mauritania                                   | UG | Uganda                   |
| BY | Belarus                  | IS | Iceland                                  | MW | Malawi                                       | US | United States of America |
| CA | Canada                   | IT | Italy                                    | MX | Mexico                                       | UZ | Uzbekistan               |
| CF | Central African Republic | JP | Japan                                    | NE | Niger  | VN | Viet Nam                 |
| CG | Congo                    | KE | Kenya                                    | NL | Netherlands                                  | YU | Yugoslavia               |
| CH | Switzerland              | KG | Kyrgyzstan                               | NO | Norway                                       | ZW | Zimbabwe                 |
| CI | Côte d'Ivoire            | KP | Democratic People's<br>Republic of Korea | NZ | New Zealand                                  |    |                          |
| CM | Cameroon                 |    |  | PL | Poland                                       |    |                          |
| CN | China                    | KR | Republic of Korea                        | PT | Portugal                                     |    |                          |
| CU | Cuba                     | KZ | Kazakhstan                               | RO | Romania                                      |    |                          |
| CZ | Czech Republic           | LC | Saint Lucia                              | RU | Russian Federation                           |    |                          |
| DE | Germany                  | LI | Liechtenstein                            | SD | Sudan  |    |                          |
| DK | Denmark                  | LK | Sri Lanka                                | SE | Sweden                                       |    |                          |
| EE | Estonia                  | LR | Liberia                                  | SG | Singapore                                    |    |                          |

## OPTICAL FIBRE ORGANISER

This invention relates to the field of fibre optics and more particularly to an organiser for the management of optical fibres.

Optical fibre organisers for the management of all types of fibres and splicing systems are required for optical fibre, e.g. telecommunications, networks including all network elements such as at the exchange, externally and at customer premises. At present a different type of organiser is required for different organiser networks. Further, with ever increasing density of fibres becoming a priority, organiser systems are required to become ever more compact.

There is, therefore, a need for a universal organiser capable of being used in a variety of organiser networks and for a compact organiser for use in situations where conventional organisers are too large.

Organiser systems using pivotal connection of optical fibre storage trays to solid supports are known, for example W096/10203 and W098/22842, and provide the advantage that large numbers of trays can be stored close together and yet easily accessed by pivoting adjacent trays to adopt oppositely inclined orientation.

In addition, organiser systems in which a fibre optic cable is introduced into a tray through the hinge or other pivotal connection means to a solid support are known from US 5887 106. An advantage of introducing cables in this way is that disturbance of fibres as trays are moved about the pivotal connection point is minimised.

There are, however, certain desirable characteristics for such an organiser system which are not present in these prior art systems. These include the flexibility of being able easily to add and/or remove trays to a support or to change their position in relation to a support with or without a fibre stored therein. In addition, it may be desirable to allow for an optical fibre to be removed quickly and easily from the module without having to pull the entire fibre out longitudinally through an entrance hole, or removing the module as a whole.

- 2 -

According to one aspect of the present invention, therefore, there is provided an optical fibre organiser system comprising: a support, at least one fibre organiser module selectively connectable to the support, a housing for accommodating the or each module mounted on the support, and cable entry means at or adjacent one end of the support through which one  
5 or more fibre optic cables can enter the housing generally parallel to the length of the support, characterised in that the support comprises two substantially parallel elongate members, the or each module being pivotally connectable to the said members, and in that the pivotal connection between a module and at least one of the members defines a passage for the introduction of an optical fibre into the said module.

10

One advantage of this configuration is that the pivotal connection of the module to the member can easily be made releasable, allowing the possibility that a module may be removed if it is no longer needed, or that additional modules can be added easily at a later date if the organiser system is to be expanded,

15

Existing organisers use solid plate-like supports to which optical fibre trays may be attached. Another advantage of the system of the present invention is that the support can be an open and simple structure having two spaced elongate members extending substantially parallel to one another. This arrangement has the advantages of simplicity and economy of construction  
20 whilst providing an accessible structure which is easy to work on. In a preferred embodiment the support has two elongate members extending substantially parallel to one another with optional transverse connecting members spanning the parallel members preferably at one or both extremities thereof to form an open frame.

25 In a preferred embodiment the passage for the introduction of an optical fibre is formed through the main body of the support and part of the module.

The support may be attachable to the housing, for example by means of an attachment member located at one end of the support member.

30

The housing may take the form of or be part of an optical fibre management pedestal, box or closure. The housing may comprise a base through which cables can extend and a protective cover for the base.

- 5 The organiser system is provided with at least one and preferably a plurality of optical fibre organiser modules. Each of the optical fibre organiser modules may be in the form of a tray or cassette. The modules, which may be easily manufactured by vacuum forming of plastics material, may be identical or may vary in size, shape and function. It is preferred that some, and preferably all, of the modules take the form of splice organiser trays or cassettes for the
- 10 splicing or splitting of optical fibres. Where all of the modules take the form of splice organisers separate means may be provided in the organiser system to allow for the releasable connection of optical fibres. Such means may take the form of a patch panel. Alternatively some of the modules may take the form of connector organisers for the patching of optical fibres. Such modules may be provided with means for receiving optical fibre connectors,
- 15 which means may take the form of a frame or panel defining apertures for receiving optical fibre connectors. Such apertures may conveniently be in one or more rows. The support and the modules may be adapted to allow the modules to be slidably mounted to the support. Means for allowing the sliding movement may be provided on either or both the module and the support. In embodiments in which the support takes the form of an open frame having
- 20 two substantially parallel elongate arms the modules may be adapted to be received on, between or around the two elongate arms preferably so as to extend generally transversely of the support. For this purpose the modules may be provided with an attachment member, which may be integral to the modules, which attachment member is preferably dimensioned so as to be capable of being received within the arms of the support. The module may be
- 25 freely slidable along the support, in which case releasable locking means may be provided for releasably locking the module in any desired position or in set, pre-determined positions with respect to the support member. The releasable locking means may take any suitable form and may be provided on the support and/or on the module. In a preferred embodiment the attachment member of the module is provided with a degree of resilience allowing it to slide
- 30 within the support member when appropriate pressure is applied but to lock or be clamped into place in the absence of such pressure. The attachment member may be snap-engageable to the support.

In some embodiments the attachment member has a V-shape end wall spanning opposite walls thereof the surfaces of which, or projections from which, engage the support and can be caused to move towards or away from one another by application or release of pressure  
5 whereby to engage or release the attachment member to or from the support.

The mounting of the module or modules with respect to the support is preferably such as to allow movement other than sliding to take place. For example the module or modules may be releasably engageable in pre-determined positions. The modules are pivotally movable  
10 with respect to the support to facilitate access to adjacent modules. Pivotable locking means may be provided to lock individual modules releasably into the access or the stored position. Such locking means may be separate, e.g. a clip to be inserted by the fitter adjacent to the pivot point of the module, or may be integral, e.g. detent means provided on the support and/or the module.

15

The modules may be arranged on either side of the support, for example in back-to-back pairs. For some applications, where the most compact arrangement is required, it may be appropriate for modules to be mounted on only one side of the support member.

20 Whilst in some embodiments fibres are threaded longitudinally through the passage it may be preferable also to provide for the introduction or removal of the fibres laterally of the pivot axis. In such embodiments entry/removal of fibres is possible following pivotal connection of a module to the support without detaching the module from the support and without pulling the whole fibre out longitudinally. For this purpose the support may have a plurality of  
25 transversely extending slots to allow one or more optical fibres to be positioned such as to pass from one side of the support to the other by introducing it or them transversely into the slot. Furthermore the or each module may have an open ended slot in a part thereof engageable with the support, the arrangement being such that the module can be turned between a first orientation with respect to the support in which the slot in the said part of the  
30 module and a slot in the support are in register to allow at least one optical fibre to be introduced transversely thereinto, and a second orientation in which the two slots are inclined to one another whereby to retain any optical fibres in position in the slot.

The housing of the optical fibre organiser system may take the form of or be part of an optical fibre management housing, which may be a pedestal, box or other closure. The housing may include a base through which cables can extend, and a protective cover for the  
5 base.

The cable termination means of the optical fibre organiser system secure cables entering the system and may take any suitable and form and may include the use of strain relief clamps. The cable termination means may include securing means which may be associated with tie  
10 wraps or other gripping members or tightening means for securing optical fibres extending into the housing.

The optical fibre organiser system of the present invention may be provided with guide means for guiding optical fibres being routed through the organiser system. Such guide means may  
15 be provided on the support and/or on the housing and/or on the or each module. Such guide means are sometimes required for guiding optical fibres to and from the modules within the housing. The guidance may take the form of arcuately shaped walls having a pre-determined bend radius with optional tabs to retain the optical fibres in a groove or channel formed by the walls. Such tabs may have a degree of flexibility to aid location. Other suitable guide  
20 means include channels, grooves, apertures, tie wraps or other guide devices such as projections or hook-like members.

If necessary transport tubes may also be provided for the protection of optical fibres being routed through the organiser system. Suitable transport tubes will be well known to the  
25 skilled man.

The organiser system of the present invention may also be provided with storage means for storing optical fibres which are not spliced or connected in the housing. Such storage means may take the form of a container or organiser, e.g. a tray, which may include substantially  
30 rigid members around which stored optical fibre may be wound at or above its minimum bend radius. In this way lengths of optical fibre which may be required in order to be able to carry out future splicing/connection operations may be stored within the system and protected

during that storage from being bent below its critical bend radius. The storage means may form part of the housing, for example it may form part of the base of a housing formed from a base and cover part, or may be a specific module (or plurality of modules) formed or adapted for this purpose.

5

In a preferred embodiment the optical fibre organiser system according to the present invention takes the form of an optical fibre management closure, and in a particularly preferred embodiment an optical fibre splice closure. Optical fibre splice closures, which are sometimes called splice cases comprise a casing which provides an enclosed space for  
10 containing one or a plurality of optical fibre splice organisers containing splices between optical fibres. An example of an optical fibre splice closure in which one or more splice organisers are disposed in stacked arrangement within a domed protective housing is disclosed in WO95/07480. There are a number of differing splicing arrangements used commercially and splice closures should be capable of accommodating a variety of them. A  
15 difficulty with some conventional prior art splice closures is that their arrangement of components is complex, leading to difficulties in use and access, and in some cases complex routing of optical fibres can lead to damage.

An organiser system in the form of a splice closure according to the present invention  
20 substantially overcomes or mitigates the problems of prior art splice closures.

When the organiser system is in the form of a splice closure, the modules are optical fibre splice organisers. Such splice organisers are preferably in the form of trays, cassettes or the like each of which is for holding, organising or accommodating optical fibre splices (e.g.  
25 fusion splices) and/or splitters or couplers. The splice holders are advantageously situated on the splice organisers to retain the individual splices between corresponding optical fibres. A typical splice holder may accommodate 4 to 10 splices and should be able to secure them in such a way as to prevent damage occurring due to mechanical shocks and vibrations to which optical fibre systems may be subject in use. The splice holders are preferably such as to allow  
30 splices to be held side by side in substantially mutually parallel positions, and more preferably with the splices lying substantially perpendicular to the direction in which the optical fibre cables extend into the splice closure housing.



The or each module may be in the form of a tray having upstanding walls defining guide channels for lengths of optical fibre to be stored therein. The or each module tray may have an openable cover.

5

The housing of the splice closure according to the present invention preferably is a two-part housing having a base part and a protective cover. The cover may be a generally tubular or cylindrical shell. It may have two open ends (for an in-line system) or a single open end (for a butt closure). The cover may be in one-part or in two parts, e.g. two half-shells.

10

The housing may include sealing means for sealing the splice closure against moisture ingress. Sealing means are particularly important at the entrance points of the cables into the housing. Sealing means may include a sealing device and/or sealing gel of compressible sealant material.

15

A clamping device may be provided for securing the cover and the base of a two-part housing. A gasket, e.g. or ring for sealing between the two parts may also be provided. Alternative fastening means for a two-part housing include adhesive, screws, nuts and bolts, bayonet coupling etc.

20

The base of a two-part housing may contain optical fibre routing and management devices (e.g. storage means) and cable entry ports.

25

The splice closure according to the present invention may be an in-line splice closure, in which case the housing may have dual opposing end caps through which cables penetrate, or a butt splice closure having a single end cap. The splice closure according to the present invention may be provided with means for the connection of optical fibres. Preferably such means take the form of a patch panel for securing and retaining optical fibre connectors.

30

Such a patch panel may take any conventional and suitable form and may include a plurality of apertures for receiving connector assemblies, with such plurality of apertures generally arranged in one or more rows or in an array of rows and columns. It is preferred that the connection means, e.g. patch panel, should be positioned such that the connections of the

optical fibres extend substantially parallel to the longitudinal axis of the housing and/or parallel to the splice directions of the splices on the splice organisers.

In a preferred form the splice closure of the present invention takes the form of a tubular casing with a patch panel and one or more splice organiser trays lying transversely to the tubular axis and more-or-less aligned with each other along that axis. In a compacted arrangement the housing takes a form of a tubular fibre optics organiser casing in which the splice organisers and the patch panel are vertically aligned i.e. in series one below the other.

- 5
- 10 The present invention is advantageous as it provides a universal organiser capable of use in exchanges, externally and in customer premises or any other network elements of a telecommunications network. The organiser system may be used in indoor and outdoor aerials, buried, manhole, shelf, closure, box, pedestal, or cabinet systems. The present invention allows for fast and easy installation, requires few components, and provides a
- 15 functional, reliable optical performance. It allows a connector-rich approach and high density and high capacity. In particular the present invention provides an organiser system which is compact, particularly in relation to its capacity, in which components may be stacked one on top of each other. The organiser system of the present invention is versatile and is able to accommodate loose tube, central and slotted core, ribbon and pig-tail fibres. The organiser
- 20 system of the present invention overcomes the problems of many known organisers which are complex and which require lengthy installation times.

For a better understanding of the present invention, and to show how the same may be put into effect, reference will now be made, for the purposes of illustration only, to the

25 accompanying drawings in which:

Figure 1 is a schematic perspective view illustrating the main components of a first embodiment of the present invention;

Figure 2 is a schematic partial perspective view from a different angle showing the manner in which a module tray is connected to the support frame;

30 Figure 3 is a schematic perspective view of a module frame suitable for use in the embodiment of Figures 1 and 2;

Figure 4 is a sectional view through the connector arm of a module tray of an alternative embodiment;

Figure 5 is a schematic perspective view of an alternative embodiment of the present invention;

5        Figure 6 is a side view of the embodiment of Figure 1, showing one example of use;

Figure 7 is a front view of an alternative embodiment of the invention; and

Figure 8 is a scrap perspective view showing the connector arrangement in an alternative embodiment.

10    Referring now to Figures 1 to 3 an optical fibre organiser system generally indicated 11 as a support frame 12 for a plurality of tray-like modules 13 to be held one above the other in a vertically spaced tower-like configuration.

The organiser structure 11 may be provided with a circular base (not illustrated in Figure 1, but see the alternative embodiment of Figure 5) through which are a number of cable ports and over which may be fitted a cylindrical closure housing (again, not illustrated in Figure 1, but see Figure 5). Alternatively, however, the optical fibre organiser system 11 may be mounted within a housing of different form, for example a rectangular cabinet, in which case several such systems may be positioned side-by-side within the cabinet.

20

The support frame 12 comprises two parallel rectilinear support arms 14, 15 joined at the top by a transverse limb 16, and fixed at the bottom by means of a bracket 17 to a base member 18 which may form part of the base of the housing within which the organiser system is mounted, or may be carried thereon.

25

As illustrated in Figures 2 and 3, each of the trays forming the modules 13 has a generally flat tray-like shape with a flat, oval bottom 21 surrounded by an upstanding peripheral wall having two parallel rectilinear portions 23, 24 and two semi-circular arcuate portions 25, 26. From one of the parallel rectilinear wall portions 23 projects an attachment member, generally indicated 23a, in the form of two arms or lugs 27, 28 joined by a rear wall 29 having a V-shaped central section 29a which gives the rear wall 29 a degree of resilience such that a pressure applied to the two arms 27, 28 to press them together can allow a small

30

- 10 -

displacement for purposes which will be described in more detail below. The rear wall 29 joins the arms 27, 28 at a point midway along their length such that projecting portions 27a, 28a extend beyond the rear wall 29.

5 Inboard of the rear wall 29 each of the arms 27, 28 has a circular opening 30, 31 aligned with one another such that when the two arms 27, 28 are introduced between the two frame arms 14, 15 the openings 30, 31 can be engaged over aligned inwardly projecting circular bosses 32 (only three of which are visible in Figure 2) the engagement being achieved by pressing the projecting arm portions 27a, 28a together so as to snap engage the arms 27, 28 over the  
10 bosses 32.

Each of the bosses 32 has a central hole 33 passing through itself and the corresponding frame arm 14, 15 so that, when a tray 13 is snapped into engagement over two aligned bosses 32, there is a passage through the openings 33 from a position outside the arms 14, 15 into  
15 the interior of the tray, this passage being aligned with a pivot axis defined by the engagement of the openings 30, 31 on the bosses 32 which allow the tray 13 to be turned through a limited range of angles between a lowermost inclination where the straight part 23 of its peripheral wall engages the frame arms 14, 15 and the tray is inclined downwardly, to a corresponding position with the tray inclined upwardly. The downward inclination of the  
20 trays 13 is illustrated in Figure 1.

Each frame arm 14, 15 is provided with a plurality of elongate tubular curved guides 34 one end of each of which is aligned with a respective corresponding opening 33 such that, as illustrated in Figures 1 and 2, optical fibres generally indicated 35 can be introduced into the  
25 tray 13 by threading them through the arcuate tubular guides 34 so as to pass through the openings 33 and then into the interior of the tray 13.

As will be seen from Figure 3 each tray 13 has upwardly projecting guide walls 36, 37, 38 upstanding from the base 21 of the tray and spaced inwardly from the peripheral wall  
30 portions 25, 26, 27 to provide guide channels for coiling surplus lengths of optical fibre therein. A plurality of mountings 39 for retaining optical fibre splices are positioned adjacent the long side 24.

Incoming optical fibre 35 from a duct or trunking 41 (Figure 1) passing through the entry ports (not shown) in a base (not shown) are then led up to the cable entry guides 34 into selected splice module trays 13. The splices in the trays 13 can be made to so-called "pig-tails" namely lengths of optical fibre having a connector at one end, one of which is shown in Figure 1 and identified with the reference general 42, the connector 43 being illustrated in position on a patch panel 40 in the form of an approximately circular plate having a plurality of openings 44 for receiving connectors 43. The patch panel 40 may be selectively positionable on the arms 14, 15 of the support frame and, in other embodiments, there may be a plurality of patch panels one above the other in dependence on the number of splice trays 13.

One advantage of this organiser system lies in its great versatility in that splices can be made utilising a single tray 13 on the support frame 12, which can be positioned anywhere along the length of the frame 12 selected by the fitter. Likewise, if required, a relatively large number of trays, typically up to twenty, may be fitted selectively in position with up to, say, five patch panels serving to make the connections from the splices in the trays 13 via appropriate pig-tails. Another advantage of this structure lies in the fact that pig-tails of substantially the same length can be used to join a splice in a tray 13 independent of its position along the arms 14, 15 to a patch panel 40, again independent of its position along the arms 14, 15 since any surplus length of optical fibre can lie in a suspended loop along side the frame 12 without requiring separate cable management. The loose coils do not suffer from the risk of being bent through a curve sharper than the minimum bend radius so that, when working on the system, the fitter is unlikely to cause transient transmission losses in the fibres which are in use whilst attending to the fibres requiring attention. Likewise, because the cable entry guides 34 direct the optical fibres 35 into the trays 13 parallel to and in alignment with the hinge axis about which trays are turned from their normal rest position in order to allow access to the interior of an underlying tray 13, there is no risk of the cables in the displaced trays 13 being turned through a curvature less than the minimum bend radius and, therefore, no risk of transient transmission losses even if these fibres are in use at the time that the operations are taking place. Furthermore, in a cabinet configuration where there may be several organiser systems such as that illustrated in Figure 1 positioned side by side in a

densely packed array, it is possible to move the whole frame 12 carrying the splice trays 13 and patch panel 40 out from the cabinet by releasing the bracket 18 from the base since the length of optical fibre 35 extending through the base of the housing first runs to the splice trays 13 so that a greater freedom of access and space for manipulation of the fibres is available.

Figure 4 illustrates an alternative embodiment, similar to that of Figure 2, but in which the arms 14, 15 of the frame are simply provided with plain openings and the rearwardly projecting lugs or arms 27a, 28a of the tray 13 have bosses 32a with apertures passing through them to receive the cable entry guides 34. Other embodiments (not illustrated) may be envisaged in which the engagement between the arms 27, 28 of the tray 13 is frictional engagement so that the tray 13 can be slid up or down the frame 12 by pressing together the lugs 27a, 28a to release the frictional engagement between the tray and the arms 14, 15.

Figure 5 illustrates a different embodiment in which there is no patch panel, and in which a base 50 having cable entry ports 51, 52, 53 carries the support frame 12 and has a circular shape to receive a cylindrical housing member 56 having a domed top 54 which can be sealed around the perimeter of the circular base 50 to provide an enclosure for the splice trays 13 which is isolated from the environment.

Figure 6 illustrates one way of using the embodiment of Figure 1 in which surplus optical fibre is supported by a carrier 55 to the "rear" of the frame 12, that is on the side of the frame opposite the splice trays 13. Again, the base 50 is circular and may carry a cylindrical housing (not shown) corresponding to that of the embodiment of Figure 5.

Figure 7 shows an alternative configuration suitable for use in a rectangular cabinet, in which a plurality of organisers may be positioned side by side. Figure 7 illustrates one end portion of a rectangular cabinet 56 having a bottom wall 57, side wall 58 and top wall 59 with a back wall 60. The support frame 12 is carried on the back wall 60 by two lugs 61, 62 and appropriate fixings, and the splice trays 13 may be fitted to the frame 12 in any of the ways described in relation to the earlier embodiments. The bottom wall 57 of the cabinet 56 houses a number of cable entry ports 63, 64 and a patch panel 65 of known form comprising

a plurality of inclined strips on a zigzag element allowing a plurality of connectors 66 to be positioned along side the splice trays 13 improving accessibility to the connectors.

Finally, Figure 8 illustrates the form of a splice tray having means by which optical fibres can be introduced by lateral displacement into the tray without having to be threaded through a cable entry guide such as the guide 34 in the embodiments of Figures 1 and 2. In Figure 8 a portion of one frame arm 15 is illustrated, having an opening 70 with an inclined rectilinear slot 71 having an open end 72 extending from the opening 70 to one edge of the frame arm 15.

The splice tray 13 has a rearwardly projecting connector arrangement similar to that of the tray 13 illustrated in Figures 2 and 3, and the same reference numerals will be used for identical components or those fulfilling the same function. Here the rear wall 29 is again provided with a V-shape section 29a to allow snap engagement of bosses 32 extending outwardly from the lugs or arms 27, 28 into the holes of 70 of the frame arm 15, and a corresponding hole (not shown) in the frame arm 14 which is not illustrated in Figure 8.

In this embodiment, unlike the embodiment of Figure 4, the boss 32 has a longitudinally extending radial slot 80 from a point on its outer cylindrical surface to the central opening 33.

The lugs or arms 27, 28 likewise have corresponding inclined slots 81, 82 which extend from the longitudinal slot 80 in the boss 32 to an opening in the upper edge of the respective arms 27, 28. The inclination of the slot 71 in the frame arm 15 is at an angle to the length of the arm itself which corresponds to the inclination of the slot 82 when the splice tray 13 is held appropriately perpendicular to the frame arm 13. In this orientation the slots 71 and 82 are in alignment with one another and an optical fibre can be introduced into the tray 13 by sliding it sideways along the aligned slots 71, 82, through the axial slot 80 of the boss 32 and into the central opening 33. Thereafter, whilst holding the optical fibre in the opening 33, the tray 13 is lowered to its normal rest position in which the slot 82 is no longer in alignment with the slot 71. The optical fibre is then retained in the opening 33 and cannot be withdrawn therefrom (except longitudinally).

- 14 -

One particular advantage of the configuration illustrated in Figures 1 to 6 lies in the fact that the displacement of a fibre to reach any part of a patch panel is very much less than the length of the fibre itself so that even with fibres of all the same length there is no difficulty in reaching any particular part of the patch panel and no risk of the fibres being bent beyond  
5 their minimum bend radius in doing so.

A typical splice closure utilising the optical fibre organiser of the present invention may be adapted to fit a so-called "mini-pole" rack having dimensions of about 30 cm in diameter and about 2 metres in length. Although the drawings illustrate a butt splice closure the invention  
10 is not to be considered so limited and may be applicable to both in-line and butt splice systems.



## CLAIMS

1. An optical fibre organiser system (11) comprising: a support (12), at least one fibre  
5 organiser module (13) selectively connectable to the support (12), a housing (18) for  
accommodating the or each module (13) mounted on the support (12), and cable  
entry means (41) at or adjacent one end of the support (12) through which one or  
more fibre optic cables (35) can enter the housing (18) generally parallel to the length  
of the support (12), characterised in that the support (12) comprises two substantially  
parallel elongate members (14,15), the or each module (13) being pivotally  
10 connectable to the said members (14,15), and in that the pivotal connection between a  
module (13) and at least one of the members (14,15) defines a passage for the  
introduction of an optical fibre (35) into the said module (13).
2. An organiser system (11) according to Claim 1, characterised in that the two  
15 substantially parallel elongate members (14,15) of the support (12) are joined by a  
transverse member (16) to form an open frame.
3. An organiser system (11) according to Claim 1 or Claim 2, characterised in that the or  
each module (13) extends generally transversely of the support (12).
- 20 4. An organiser system (11) according to any of Claims 1 to 3, characterised in that the  
or each module (13) has an attachment member (23a) by which it is pivotally  
connected to the support (12).
- 25 5. An organiser system (11) according to Claim 4, characterised in that the said  
attachment member (23a) is snap-engageable to the support (12).
6. An organiser system (11) according to Claim 4 or Claim 5, characterised in that the  
attachment member (23a) is provided with a degree of resilience, allowing it, when  
30 pressure is applied, to be released from engagement with the support (12) but be held  
in place in the absence of such pressure.

- 16 -

7. An organiser system (11) according to Claim 6, characterised in that the attachment member (23a) is releasable from engagement with the support (12) when the said pressure is applied, so as to be slidable along the support (12).
- 8.
- 5 9. An organiser system (11) according to any preceding Claim, characterised in that the means are provided for releasably locking the or each module (13) with respect to the support (12).
10. An organiser system (11) according to any preceding claim, characterised in that the  
10 or each module (13) has an associated cable guide (34) for directing optical fibres (35) into or out from the module (13) with a predetermined bend radius.
11. An organiser system (11) according to any preceding claim, characterised in that the  
15 support (12) is generally upright in a normal orientation of use and there are a plurality of modules (13) positioned one above the other on the support (12).
12. An organiser system (11) according to any preceding claim, characterised in that at  
20 least one patch panel (40) is supported by the said support (12) adjacent the module or modules (13) for receiving connectors (43) of optical fibres (35) extending from the modules (13).
13. An organiser system (11) according to Claim 11, characterised in that the said at least  
25 one patch panel (40) is located generally in line between an entry port for optical fibres into a housing within which the system (11) is located and the module or modules (13) and extends generally transversely of the line between the entry port and the organiser modules (13).
14. An organiser system (11) according to Claim 11 or Claim 12, characterised in that the  
30 patch panel (40) is carried on the support (12) at a position below that of the module or modules (13).
15. An organiser system (11) according to any preceding claim, characterised in that the

housing is a generally tubular member (53) which fits over the support (12) and any modules (13) carried thereby with its axis generally parallel to the length of the support (12).

- 5 16. An organiser system (11) according to Claim 14, characterised in that the cable entry means comprise an end panel (50) of the said generally tubular housing member (56) housing sealable openings (51, 52, 53) for the entry of optical fibres or cables.
- 10 17. An organiser system (11) according to any preceding claim, characterised in that the said support (12) has a plurality of transversely extending slots (71) to allow one or more optical fibres to be positioned such as to pass from one side of the support (12) to the other by introducing it or them transversely into the slot (71).
- 15 18. An organiser system (11) according to Claim 16, characterised in that the or each module (13) has an open ended slot (81) in a part thereof engageable with the support (12), and the arrangement is such that the module (13) can be turned between a first orientation with respect to the support (13) in which the slot (81) in the said part of the module and a slot (71) in the support (12) are in register to allow at least one optical fibre to be introduced transversely thereinto, and a second orientation in which the two slots (71, 81) are inclined to one another whereby to retain any optical fibres in position in the slot.
- 20 19. An organiser system (11) according to any of Claims 4 to 17, characterised in that the said attachment member (23a) has a V-shape end wall (29a) spanning opposite walls (27, 28) thereof the surfaces of which, or projections from which, engage the support (11) and can be caused to move towards or away from one another by application or release of pressure thereby to engage or release the attachment member (23a) to or from the support (12).
- 25 20. An organiser system (11) according to any preceding claim, characterised in that the or each module (13) is in the form of a tray having upstanding walls (23, 24) defining guide channels for lengths of optical fibre (35) to be stored therein.
- 30

21. An organiser system (11) according to Claim 19, characterised in that the or each module tray (13) has an openable cover.
- 5 22. An optical fibre organiser system (11), characterised in that a plurality of optical fibre organiser modules (13) are held one above the other and a patch panel (40) is located beneath them such that optical fibres (35) extending between the modules (13) and the patch panel (40) can be freely suspended in unconstrained lengths.

\* \* \* \* \*

Fig.1.

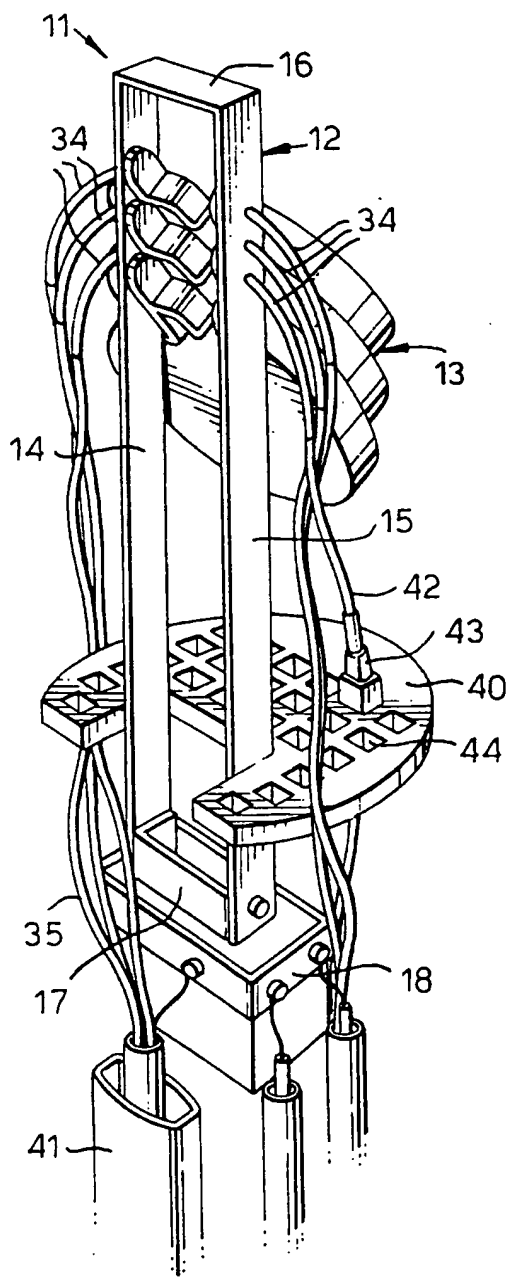


Fig.2.

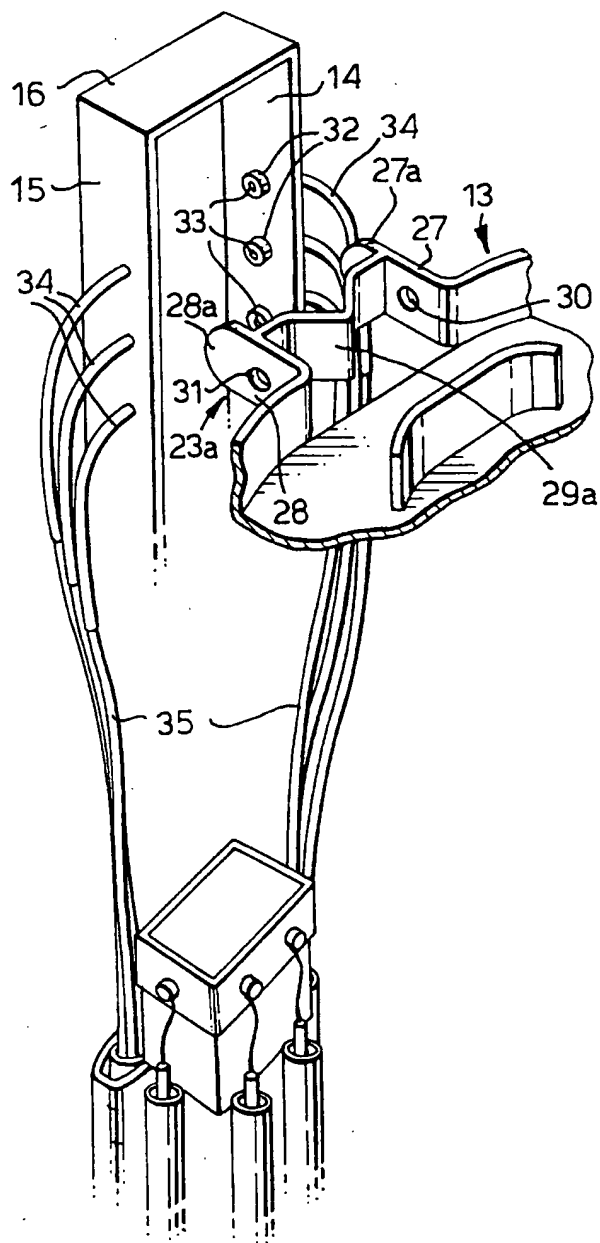


Fig.3.

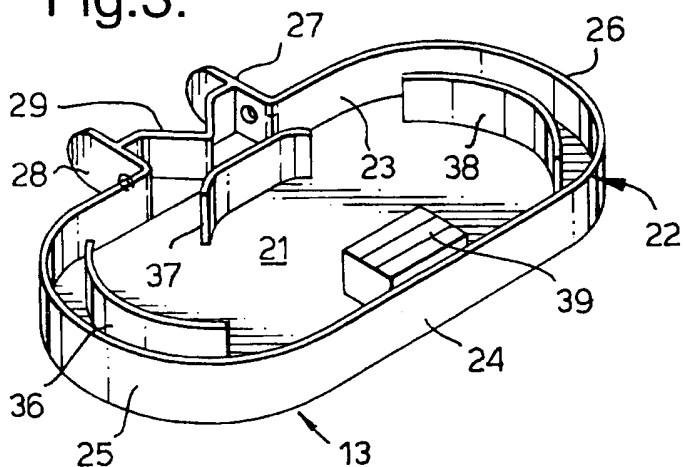


Fig.4.

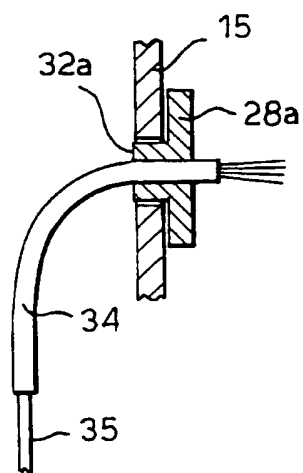


Fig.5.

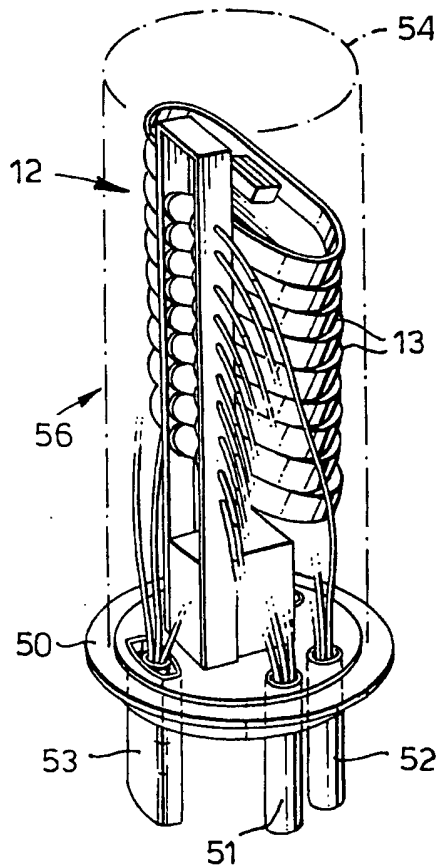
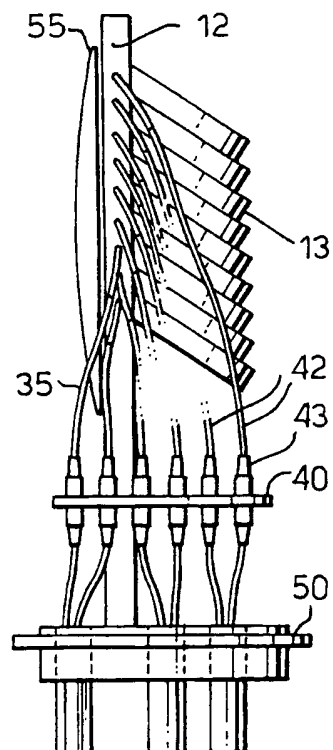


Fig.6.



3/3

Fig.7.

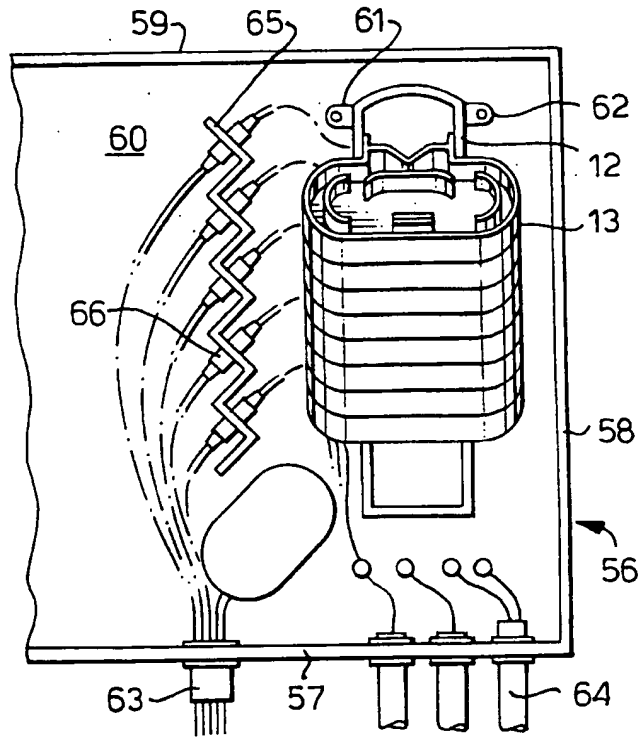


Fig.8a.

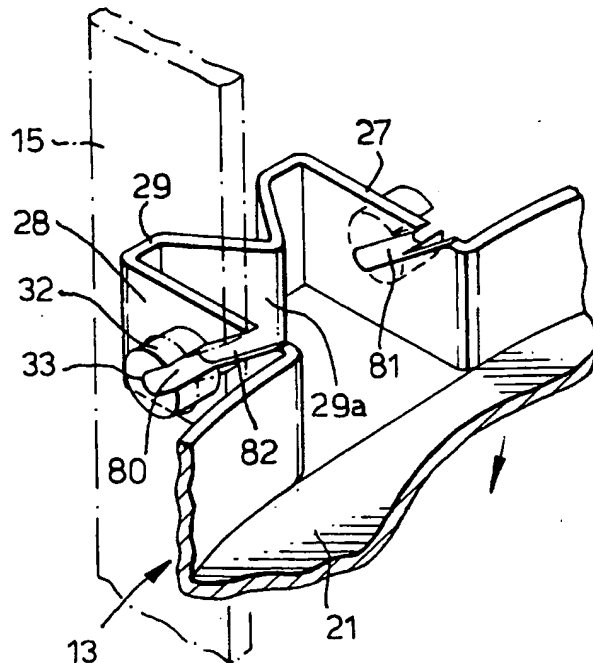
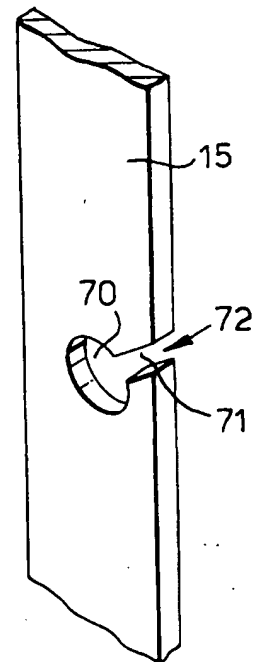


Fig.8b.



# INTERNATIONAL SEARCH REPORT

Internati Appl No  
PCT/GB 00/01577

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G02B6/44

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | US 5 887 106 A (GEORGE EDWARD K ET AL)<br>23 March 1999 (1999-03-23)<br>cited in the application<br>column 2, line 66 -column 3, line 45<br>figures 1,2,4 | 1-16,<br>20-22        |
| A          | EP 0 872 750 A (RXS SCHRUMPFTECH<br>GARNITUREN) 21 October 1998 (1998-10-21)<br>abstract<br>column 6, line 6 -column 7, line 7<br>figures 1,4             | 1                     |
| A          | EP 0 479 227 A (MARS ALCATEL)<br>8 April 1992 (1992-04-08)<br>abstract<br>figure 3  | 5                     |
|            | ---<br>-/--   |                       |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 July 2000

Date of mailing of the international search report

28/07/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Luck, W



# INTERNATIONAL SEARCH REPORT

Internat: Application No

PCT/GB 00/01577

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| A          | WO 95 07480 A (RAYCHEM SA NV ; RAYCHEM LTD (GB); MACKEN LUK JOZEF (BE); DAEMS DANI)<br>16 March 1995 (1995-03-16)<br>cited in the application<br>--- |                       |
| A          | WO 98 22842 A (MENDES LUIZ NEVES ; RAYCHEM SA NV (BE); DAEMS DANIEL (BE); GRAULUS)<br>28 May 1998 (1998-05-28)<br>cited in the application<br>---    |                       |
| A          | WO 96 10203 A (TELEPHONE CABLES LTD ; JENKINS PETER DAVID (GB); BENTON SIMON CHARL) 4 April 1996 (1996-04-04)<br>cited in the application<br>-----   |                       |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat. Application No.

PCT/GB 00/01577

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)  | Publication<br>date  |
|---|---------------------|---|--|
| US 5887106 A                              | 23-03-1999          | EP 0801317 A<br>GB 2312053 A,B  | 15-10-1997<br>15-10-1997   |
| EP 0872750 A                              | 21-10-1998          | AU 6079198 A<br>JP 10300949 A   | 22-10-1998<br>13-11-1998   |
| EP 0479227 A                              | 08-04-1992          | DE 69119684 D<br>DE 69119684 T<br>DE 69124902 D<br>DE 69124902 T<br>EP 0479226 A<br>ES 2100189 T<br>ES 2087198 T<br>JP 2801100 B<br>JP 5203814 A<br>US 5430823 A  | 27-06-1996<br>02-10-1996<br>10-04-1997<br>19-06-1997<br>08-04-1992<br>16-06-1997<br>16-07-1996<br>21-09-1998<br>13-08-1993<br>04-07-1995   |
| WO 9507480 A                              | 16-03-1995          | AT 193128 T<br>AU 691832 B<br>AU 7541094 A<br>BR 9407427 A<br>CA 2170997 A<br>CN 1133638 A<br>CZ 9600687 A<br>DE 69424555 D<br>EP 0717860 A<br>FI 961063 A<br>HU 76218 A,B<br>IL 110872 A<br>JP 9502283 T<br>NO 960934 A<br>PL 313411 A<br>RU 2133051 C<br>SK 30696 A<br>US 5740298 A<br>ZA 9406914 A | 15-06-2000<br>28-05-1998<br>27-03-1995<br>09-04-1996<br>16-03-1995<br>16-10-1996<br>11-12-1996<br>21-06-2000<br>26-06-1996<br>07-05-1996<br>28-07-1997<br>15-06-1998<br>04-03-1997<br>07-03-1996<br>24-06-1996<br>10-07-1999<br>09-04-1997<br>14-04-1998<br>02-05-1995 |
| WO 9822842 A                              | 28-05-1998          | AU 4960497 A<br>CN 1238046 A<br>EP 0939914 A<br>NO 992376 A<br>PL 333325 A  | 10-06-1998<br>08-12-1999<br>08-09-1999<br>18-05-1999<br>06-12-1999   |
| WO 9610203 A                              | 04-04-1996          | GB 2299409 A<br>EP 0730748 A<br>GB 2305739 A,B<br>US 5870519 A<br>EP 0735394 A<br>US 5835660 A  | 02-10-1996<br>11-09-1996<br>16-04-1997<br>09-02-1999<br>02-10-1996<br>10-11-1998   |